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CURRENT RESEARCH ON FUNCTIONAL ANALYSIS METHODOLOGIES: AN INTRODUCTION

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In recent years, a growing number of researchers have adopted methodologies derived from the basic study of operant behavior in an attempt to identify the environmental determinants (i.e., reinforcing functions) of specific responses that currently exist in an individual's repertoire. This approach to the study of behavior in applied settings has come to be known as the *functional analysis model* of assessment and treatment. Most of the activity in this area has focused on a variety of socially maladaptive behaviors and has striven to answer two different but related questions: (a) What types of assessment methodologies provide reliable and valid data about behavioral function, and how can they be adapted for use in a particular situation? and (b) How might the results of such assessments improve the design and selection of treatment procedures? The articles appearing in this special issue exemplify both efforts. Although diverse from the standpoints of methodology, independent and dependent variables, subjects, and settings, all of the articles reflect a clear focus on the analysis of environment–behavior interactions and on the relationship between assessment and treatment.

Behavioral Assessment

As a follow-up of Iwata, Dorsey, Slifer, Bauman, and Richman (1982), Iwata et al. present data from a long-term study on the determinants of self-injurious behavior (SIB). Their descriptions of methodology should be instructive to both researchers and clinicians, and their results, amounting to over 150 replications, firmly establish the value of experimental approaches to behavioral assessment in building an epidemiological data base on the contingencies that maintain SIB. Moreover, their summary of treatment data provides a new means for evaluating intervention effects. Their analysis showed that, when the functional characteristics of treatment were matched with those of behavior, reinforcement-based interventions appeared to be just as effective as punishment, and the situations in which punishment was needed were greatly reduced.

The study by Munk and Repp provides insight into a different clinical disorder but one that also has serious health implications—chronic food refusal. By varying the types and textures of food presented during assessment and measuring several responses as indices of avoidance, the authors were able to identify four distinct patterns of refusal: (a) total refusal (i.e., low overall intake), (b) selective refusal based on food type, (c) selectivity based on texture, and (d) selectivity based on both type and texture. In their discussion, Munk and Repp describe how different patterns of food refusal relate to both antecedent and consequent approaches to intervention, and how assessment procedures may be further refined to isolate a variety of potential reinforcers for either low overall or selective food intake.

Taylor and Romanczyk describe a novel approach to behavioral assessment in classroom situations. After noting that teacher attention was unequally distributed among students during small-group instruction, they examined student behavior

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under conditions in which antecedent and consequent events were arranged experimentally. In comparing the results of both analyses, Taylor and Romanczyk found that higher levels of teacher attention during instruction were predictive of student behavior maintained by attention (as revealed during the functional analysis), whereas lower levels of teacher attention were predictive of student behavior maintained by escape. Thus, analysis of the distribution of teacher attention toward a target student relative to that toward peers might be helpful as a preliminary means of differentiating attention versus escape as reinforcers for problem behavior.

The finding that some behavior disorders are maintained by more than one source of reinforcement within the same individual has been shown in several studies and is therefore not a surprising one, but it does present a particularly challenging task from the standpoint of both assessment and treatment. Two studies in this special issue demonstrate the utility of functional analysis methodologies in identifying the phenomenon of "multiple control." In the first study, Derby et al. show how different reinforcement functions for stereotypy versus aggression and SIB may be revealed during assessment by separating data on the basis of response topography. In the second study, Day, Horner, and O'Neill present three cases in which SIB (in 2 subjects) and aggression (in a 3rd) were maintained by both positive and negative reinforcement; their data show selective treatment effects when intervention is aimed at only one of the functions.

In the final study focusing primarily on assessment, Harding, Wacker, Cooper, Millard, and Jensen-Kovalan provide a systematic replication of the use of brief functional analyses in outpatient clinics. Their data suggest that multiple assessment conditions can be presented during a single evaluation, and that the arrangement may be used not only to identify reinforcers for inappropriate behavior but also to test the effects of potential interventions.

Data from the above studies provide multiple replications of the use of functional analysis and reveal the robustness of the approach across significant variations in procedure and other study characteristics. In addition, the results raise a number of questions about behavioral function (e.g., of food refusal), the use of alternative assessment strategies (e.g., measurement of teacher behavior alone vs. student and teacher behavior as indicators of contingency), further refinement of existing methodology to examine difficult problems such as multiple control, and adaptations of procedures for use in time-limited situations such as those found in the typical outpatient clinic or during consultation in the home.

Treatment

With the central theme of this special issue serving as a guide for organization, studies focusing on treatment have been grouped not according to problem or procedure but, rather, on the basis of maintaining contingency. It is interesting to note that each of the studies also includes an analysis of antecedent influences on behavior, influences that hold significant promise as efficient yet powerful interventions.

The first two studies provide an interesting contrast in results when the same intervention was applied to the same behavioral function. Pace, Ivancic, and Jefferson describe the use of stimulus (demand) fading as treatment for escape-maintained obscenity in an adult with head trauma. For practical reasons, they were unable to use extinction, but this fact makes their study unique because the effects of antecedent intervention were evaluated against a baseline of reinforcement for the inappropriate behavior that remained intact throughout treatment. Pace et al. found that obscenity was virtually eliminated when demands were withdrawn completely at the beginning of treatment and, more important, that the behavior did not recur as the frequency of demands was increased gradually across sessions. In a study using very similar methodology, Zarcone, Iwata, Smith, Mazaleski, and Lerman also found that the elimination of demands produced immediate and large reductions in escape-maintained SIB exhibited by 3 subjects. However, SIB increased and was maintained in each subject as fading progressed, apparently as a result of contacting the escape contingency. These

divergent results occasioned inevitable discussions among the authors (Pace, Ivancic, and Iwata used to work together; currently, Zarcone and Pace are colleagues) in an attempt to reconcile the findings, to the point where the original source of a given explanation was forgotten. So the authors divided the explanations and offer them for readers' consideration.

Two studies describe the treatment of behavior disorders maintained by attention. The first, by Hagopian, Fisher, and Legacy, involved an unusual case of multiple behavior problems exhibited by quadruplets. A lengthy functional analysis was conducted of the subjects' behavior, which was interesting in its own right due to the variability observed during initial sessions, a finding that has implications for assessments in which there are relatively few exposures to a given condition. After establishing that all subjects' inappropriate behaviors were maintained by attention, the authors, guided by practical considerations in the simultaneous treatment of 4 children, implemented noncontingent reinforcement; they demonstrated that a rich (fixed-time [FT] 10 s) but not a lean (FT 5 min) schedule of response-independent attention suppressed behavior. However, reductions in problem behavior were maintained while fading from the rich to the lean schedule.

The second study, by Rortvedt and Miltenberger, also was unusual in that the subjects were 2 developmentally normal children whose noncompliance appeared to be maintained by attention rather than escape. During treatment conducted in the home, the children's mothers implemented a "high-probability instructional sequence," in which several instructions likely to produce compliance were presented before an instruction unlikely to produce compliance was presented. This procedure was effective with 1 child but not the other. Subsequently, time-out from attention contingent on noncompliance was implemented and was associated with increases in compliance for both children.

The next two studies exemplify contrasting approaches to the treatment of SIB that is apparently maintained by nonsocial (automatic) reinforcement. In the study by Vollmer, Marcus, and LeBlanc, access to alternative sources of stimulation (toys) suppressed 1 subject's SIB almost entirely and competed to a lesser extent with the SIB of 2 other subjects. Further reductions in SIB were observed when the procedure was combined with differential reinforcement (for the 2nd subject) and with response blocking, reinforcement, and time-out (for the 3rd subject). Although the interventions used by Vollmer et al. contained several components, a common element was behavioral suppression of one response (SIB) through access to competing reinforcers that supported alternative responses (toy manipulation).

Mazaleski, Iwata, Rodgers, Vollmer, and Zarcone, while studying hand-mouthing behavior in 2 subjects, examined the effects of procedures derived from research on sensory extinction. Treatment for both subjects involved the placement of mitts on the hands; this procedure was implemented on both a noncontingent basis (at the beginning of sessions) and a contingent basis (following occurrences of hand mouthing) for 1 subject, but only on a contingent basis for the 2nd subject. Results showed that the procedure suppressed hand mouthing in both subjects, but also suggest (especially for the 2nd subject) that the behavior-reducing effects associated with the use of this type of device may be a function of punishment or time-out rather than (or in addition to) extinction.

Maintenance and Generalization

In the above four studies, training was provided to caregivers in the subjects' schools and/or residences, and follow-up data indicated generalization and/or maintenance of treatment effects. The final two studies in this special issue experimentally address those issues. Thus, they differ from the previous studies in that the focus is not on the initial effects of treatment, but on their durability.

Lerman, Iwata, Smith, Zarcone, and Vollmer examine a problem that we suspect is often encountered in practice but rarely reported in research, namely, treatment relapse. The authors suggest that, although recurrence of a behavior problem often may be traced to "procedural drift" (i.e., inconsistent program implementation), another contrib-

uting factor may be a change in the behavior's maintaining contingency over time. In reassessing 4 individuals whose SIB reemerged after initially successful treatment, they found evidence in 3 of the subjects that the behavior had acquired either new or additional functions. These data indicate that program changes (either planned or unplanned) may not only fail to maintain initial treatment gains but may also reinstate the original problem through a different mechanism of reinforcement.

Shore, Iwata, Lerman, and Shirley conducted a systematic assessment of novel stimulus parameters that may affect generalization following treatment to reduce problem behavior. They examined the extent to which posttreatment reductions in SIB were maintained during probes in which new therapists, settings, and demand sets were introduced. Results showed noticeable differences across the 5 subjects, ranging from immediate generalization across all novel stimuli to the complete absence of generalization until "treatment for novelty" was added sequentially across each stimulus parameter. Almost all research on generalization has focused on acquisition; Shore et al. provide a model for systematically assessing and programming generalization during treatment aimed at behavior reduction.

As a group, the eight intervention studies (treatment, maintenance, and generalization) provide a comprehensive analysis of the varied contingencies that maintain problem behavior and demonstrate the benefits of identifying behavioral function prior to intervention. Carefully designed assessment procedures were explicitly described, and the outcomes of assessment were used to develop treatments that would eliminate, alter, or compete with the contingency responsible for behavioral maintenance. Thus, the studies serve as excellent examples of the functional analysis model of assessment and treatment and of the type of methodology we hope will characterize intervention research in the years to come.

Commentaries

The last group of articles in the special issue consists of commentaries offered by individuals whose work has both defined and extended the methodologies illustrated in research published not only in this issue of *JABA* but throughout the last decade. Charles Mace, Edward Carr, Robert Horner, David Wacker (with Wendy Berg, Linda Cooper, Mark Derby, Mark Steege, John Northup, and Gary Sasso), Alan Repp, and Brian Iwata offer their personal perspectives and insights on the history, current status, and/or future of research on functional analysis.